Chemical Studies on the Ocean. (LXI) : Chemical Studies of the Shallow-water Deposits. (14) : On the Chemical Constituents of the Shallow-water Deposits along the Sea-coasts of Tottori and Hyōgo Prefectures

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Chemical Studies of the Shallow-water Deposits. (14) On the Chemical Constituents of the Shallow-water Deposits along the Sea-coasts of Tottori and Hyōgo Prefectures[1)]

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Received July 28, 1956

We have analysed eight kinds of deposits from the sea-coasts of Tottori and Hyōgo Prefectures, and found that the sand collected at the sea-coast of Akashi is exceedingly high in SiO_2 and low in Fe_2O_3, Al_2O_3, CaO, MgO, alkalies, etc.

The K_2O content in these deposits ranges 1.17~3.45 %, and it is considerably high in the sample collected at Sotobama of Kyūhin Peninsula.

INTRODUCTION

In the previous paper[2)], we have reported on the chemical composition of nine kinds of the deposits from the sea-coasts of Yamaguchi and Shimane Prefectures. In this paper, the analytical results on eight kinds of deposits from the sea-coasts of Tottori and Hyōgo Prefectures are described. The shallow-water deposits near the shoreline in these districts are made up chiefly of sands, gravels and boulders and of a small quantity of muds. It is shown in the Chart No. 111** that mud banks dry, extending over a comparatively small area, at nearly lowest low water at Aioi Bay. The samples in this report consist of six kinds of sands and two kinds of muds.

SAMPLES

Locality and date of sampling are shown in Table 1.

These samples are the deposits collected in the neighbourhood of the shoreline.

Sample 66: grayish sand containing small amounts of shell fragments; collected by S. Sumi at Uchibama of Kyūhin Peninsula.

Sample 67: yellowish white sand; collected by M. Matsuda at Sotobama of the same.

Sampe 68: grayish sand containing small amounts of shell fragments; collected by T. Tsukada at the point about 100 m northeast of the estuary of the Uda River.

Sample 69: light brown sand containing small amounts of shell fragments;

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** Issued by the Japanese Hydrographic Office in 1930.

Table 1.

Sample No.	Locality	Date
66	Yoshizu, Sakitsu-mura, Saihaku-gun, Tottori Prefecture	Aug. 12, 1948
67	Ōshinozu-mura, Saihaku-gun, Tottori Prefecture	Aug. 16, 1948
68	Yodoe, Yodoe-machi, Saihaku-gun, Tottori Prefecture	Aug. 20, 1947
69	Ajiro-mura, Iwami-gun, Tottori Prefecture	Sept. 3, 1947
70	Ōkura-machi, Akashi-shi, Hyōgo Prefecture	Aug. 25, 1948
71	Shinzaike, Aboshi-ku, Himeji-shi, Hyōgo Prefecture	Aug. 10, 1947
72	Naba-machi, Aioi-shi, Hyōgo Prefecture	Aug. 21, 1948
73	〃 〃	〃

collected by Y. Yonezawa in the neighbourhood of the estuary of the Gamō River.

Sample 70: yellowish white sand containing relatively many gravels; collected by M. Maeda at the point about 2.5 km east of the estuary of the Akashi River.

Sample 71: grayish brown sand; collected by M. Ueda at the point about 1 km northeast of the estuary of the Ibo River.

Samples 72 and 73: grayish green muds containing shell fragments; collected by S. Ōmi, the former at the point near the estuary of the Ukoku River and the latter at the point slightly southwest of the same river.

The size composition of these samples is shown in Table 2.

Table 2. Size composition of the deposits.

Sample No.	Mesh[a]						
	>8	14	28	48	100	200	pan
	%	%	%	%	%	%	%
66	3	3	3	3	50	30	8
67	0	3	66	30	1	0	0
68	1	2	34	44	18	1	0
69	0	0	2	17	70	11	0
70	23	2	31	35	8	1	0
71	2	1	21	45	27	4	0
72	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
73	n.d	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

[a] Tyler standard.

The geology of the land adjacent to the locations sampled is briefly as follows*:

Samples 66 and 67: Quaternary formations.

Sample 68: Quaternary formations; (andesite).

* The rocks and formations which distribute in the land areas not so far from the location of collection are put in parentheses.

Sample 69: granites; (Quaternary formations).
Sample 70: Quaternary formations; (Tertiary formations).
Sample 71: Quaternary formations; (liparite).
Samples 72 and 73: liparite.

EXPERIMENTAL PROCEDURE, RESULTS AND DISCUSSION

Experiments were carried out as described previously[3].

The analytical results of the air-dried samples are shown in Table 3. From this table we obtained the percentages of chemical constituents in the sea-salt-free samples dried at 105~110°C as shown in Table 4*.

It is seen from Table 4 that Samples 67 and 70, which are the yellowish sands, have exceedingly high content of SiO_2 and considerably low contents of Fe_2O_3, Al_2O_3, CaO, MgO, etc. This is especially remarkable in Sample 70, while Samples 66 and 68 are considerably lower in SiO_2 than ordinary sands and comparatively high in Fe_2O_3, Al_2O_3, CaO, MgO, etc. Samples 72 and 73, which are muds, have also low content of SiO_2 and comparatively high contents of Fe_2O_3 and Al_2O_3, and they have exceedingly higher content of S than sands.

Namely, in most of these deposits, a tendency can be observed that the contents of Fe_2O_3, Al_2O_3, etc. are lower in the samples of high content of SiO_2 and higher in those of low content of SiO_2.

Table 3. Chemical composition of the deposits.

Sample No.	66	67	68	69	70	71	72	73
	%	%	%	%	%	%	%	%
Drying loss	1.55	0.10	0.50	0.68	0.20	0.68	6.52	4.08
Ignition loss	4.23	0.52	2.66	2.74	0.62	1.96	8.49	9.36
Fe_2O_3	4.78	1.24	4.02	2.65	0.76	3.05	5.02	2.96
TiO_2	0.42	0.12	0.35	0.25	0.14	0.15	0.32	0.24
Al_2O_3	16.34	9.79	17.02	14.91	4.70	11.54	12.82	13.78
MnO	0.07	0.02	0.06	0.02	0.01	0.03	0.04	0.02
CaO	5.54	1.38	7.40	3.46	1.20	1.80	2.06	3.82
MgO	2.31	0.27	2.06	0.95	0.16	1.23	0.93	1.03
K_2O	1.15	3.44	1.71	2.22	1.35	2.44	2.37	2.12
Na_2O	3.52	1.98	4.00	3.40	0.80	2.06	2.39	2.07
SiO_2	59.85	80.35	60.31	68.86	89.32	75.43	58.08	60.20
SO_3	0.80	0.05	0.17	0.17	0.03	0.36	2.59	1.33
Cl	0.56	0.06	0.14	0.50	0.08	0.42	1.36	1.14
P_2O_5	0.11	0.04	0.15	0.21	0.03	0.02	0.09	0.10
CO_2	1.09	—	1.92	0.56	—	—	0.60	1.58
N	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.06	0.20

* We performed this calculation on the basis of the same assumption as in the previous paper[1].

Table 4. Chemical composition of the deposits on sea-salt-free and dry basis (calculated from Table 3).

Sample No.	66	67	68	69	70	71	72	73
	%	%	%	%	%	%	%	%
Fe_2O_3	4.91	1.24	4.05	2.69	0.76	3.09	5.52	3.15
TiO_2	0.43	0.12	0.35	0.25	0.14	0.15	0.35	0.26
Al_2O_3	16.77	9.81	17.15	15.15	4.72	11.71	14.08	14.68
MnO	0.07	0.02	0.06	0.02	0.01	0.03	0.04	0.02
CaO	5.67	1.38	7.46	3.50	1.20	1.82	2.22	4.04
MgO	2.31	0.26	2.06	0.90	0.15	1.20	0.86	0.96
K_2O	1.17	3.45	1.72	2.25	1.35	2.47	2.57	2.23
Na_2O	3.18	1.94	3.93	3.08	0.74	1.78	1.52	1.30
SiO_2	61.42	80.52	60.77	69.97	89.62	76.53	63.81	64.14
SO_3	0.75	0.04	0.15	0.11	0.02	0.31	2.67	1.28
P_2O_5	0.11	0.04	0.15	0.21	0.03	0.02	0.10	0.11
CO_2	1.12	—	1.93	0.57	—	—	0.66	1.68
N	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.07	0.21
$Na_2O + K_2O$	4.35	5.39	5.65	5.33	2.09	4.25	4.09	3.53
K_2O/Na_2O	0.37	1.78	0.44	0.73	1.82	1.39	1.69	1.72

The TiO_2 and MnO contents are low on the whole, but it seems that they are also somewhat higher in the deposits which are low in SiO_2 and high in Fe_2O_3.

As for alkalies, the K_2O content in the muds amounts to above 2 %, showing no noticeable difference from that in the muds from the sea-coasts of other districts, reported in the previous papers, i.e., those of Korea[5], Aichi[6], Hiroshima[7] and Okayama[8]. The K_2O content in the sands considerably varies with the samples, ranging 1.17~3.45 %. It is low in Samples 66 and 70, and considerably high in Sample 67. The Na_2O content is high in Samples 66, 68 and 69, but low in most of the other deposits, being especially low in Sample 70. The $Na_2O + K_2O$ content ranges 2.09 ~ 5.65 %, being low in Samples 70 and 73, and comparatively high in Samples 67, 68 and 69.

We wish to express our thanks to Mr. Y. Kaseno, Assist. Professor of Geological Institute, Faculty of Science, Kanazawa University, for useful advice in many ways, and further, to Messrs. S. Sumi, M. Matsuda, T. Tsukada, Y. Yonezawa, M. Maeda, M. Ueda and S. Ōmi who presented us many valuable samples.

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